

CLAIMS:

1 1. A method for upconverting interlaced video to progressive video with an
2 improved diagonal enhancement, comprising the steps of:
3 determining (using 70), from different pixels near a given output pixel, a
4 plurality of averages and differences, including: a vertical average (y1V), a first left
5 diagonal average (y1L1), a second left diagonal average (y1L2), a first right
6 diagonal average (y1R1), a second right diagonal average (y1R2), a vertical
7 difference (d1V), a first left diagonal difference (d1L1), a second left diagonal
8 difference (d1L2), a first right diagonal difference (d1R1), and a second right
9 diagonal difference (d1R2);
10 selecting (using 90) among the averages (y1V, y1L1, y1L2, y1R1, y1R2)
11 based on an absolute value of a minimal difference among the differences (d1V,
12 d1L1, d1L2, d1R1, d1R2); and,
13 constraining (using 44) the selecting step to the vertical average (y1V) if the
14 differences among the averages are ambiguous.

1 2. The method of claim 1, wherein the step of selecting among the
2 averages comprises the steps of selecting between the first left diagonal average
3 and the second left diagonal average (using 91) to provide a selected left diagonal
4 average (y1L) and selecting between the first right diagonal average and the
5 second right diagonal average (using 92) to provide a selected right diagonal
6 average (y1R) based on the minimal difference among the differences.

1 3. The method of claim 2, wherein the step of selecting further comprises
2 the step of selecting (using 32) among the selected left diagonal average (y1L), the
3 selected right diagonal average (y1R) and the vertical average (y1V), based on the
4 minimal difference among the respective differences.

1 4. The method of claim 2, wherein the step of selecting further comprises
2 the steps of selecting the first left diagonal average when the first left diagonal
3 average and the second left diagonal average are equal and selecting the first right
4 diagonal average when the first right diagonal average and the second right
5 diagonal average are equal.

1 5. The method of claim 1, wherein the vertical average is obtained by
2 adding a luminance component value of a vertically adjacent pixel above the given
3 output pixel with a luminance component value of a vertically adjacent pixel below
4 the given output pixel to form a sum which is divided by two.

1 6. The method of claim 1, wherein the left diagonal average is obtained by
2 adding a luminance component value of a diagonally adjacent pixel above and to
3 the left of the given output pixel with a luminance component value of a diagonally
4 adjacent pixel below and to the right of the given output pixel to form a sum which
5 is divided by two and wherein the right diagonal average is obtained by adding a
6 luminance component value of a diagonally adjacent pixel above and to the right of
7 the given output pixel with a luminance component value of a diagonally adjacent
8 pixel below and to the left of the given output pixel to form a sum which is divided
9 by two.

1 7. The method of claim 1, wherein the second left diagonal average is
2 obtained by averaging the value of the pixel two pixels to the left and above the
3 given output pixel with the value of the pixel two pixels to the right and below the
4 given output pixel.

1 8. The method of claim 1, wherein the second right diagonal average is
2 obtained by averaging the value of the pixel two pixels to the right and above the
3 given output pixel with the value of the pixel two pixels to the left and below the
4 given output pixel.

1 9. The method of claim 1, wherein the step of constraining comprises
2 constraining the selection step to the vertical average if a value for the given output
3 pixel fails to fall within a range of values defined by an adjacent pixel above the
4 given output pixel and an adjacent pixel below the given output pixel.

1 10. The method of claim 2, wherein the step of constraining comprises
2 constraining the selection step to the vertical average if a corresponding difference
3 for the selected left diagonal average substantially equals a corresponding
4 difference for the selected right diagonal average.

11. The method of claim 1, wherein:
the vertical average is based on pixels vertically adjacent to the given output pixel;
the first left diagonal average is based on upper left and lower right diagonally adjacent pixels;
the first right diagonal average is based on upper right and lower left diagonally adjacent pixels;
the second left diagonal average is based on two pixels to the left and above the given output pixel and two pixels to the right and below the given output pixel; and,
the second right diagonal average is based on two pixels to the right and above the given output pixel and two pixels to the left and below the given output pixel.

12. The method of claim 11, wherein the step of selecting comprises the steps of:
selecting (using 91) between the first left diagonal average and the second left diagonal average to provide a selected left diagonal average (y1L); and,
selecting (using 92) between the first right diagonal average and the second right diagonal average to provide a selected right diagonal average (y1R) based on the minimal difference.

13. The method of claim 12, wherein the step of selecting further comprises the step of selecting (using 32) among the selected left diagonal average (y1LR), the selected right diagonal average (y1R), and the vertical average (y1V) based on the minimal difference among the respective differences.

14. The method of claim 12, wherein the step of selecting further comprises the steps of:
selecting the left diagonal average when the left diagonal average and the second left diagonal average are equal; and,
selecting the right diagonal average when the right diagonal average and the second right diagonal average are equal.

1 15. A deinterlacing circuit for upconverting interlaced video to progressive
2 video, comprising:

3 means (70) for determining, from different pixels near a given output pixel, a
4 plurality of averages and differences, including: a vertical average (y1V), a first left
5 diagonal average diagonal average (y1L2), a first right diagonal average (y1R1), a
6 second right diagonal average (y1R2), a vertical difference (d1V), a first left
7 diagonal difference (d1L1), a second left diagonal difference (d1L2), a first right
8 diagonal difference (d1R1), and a second right diagonal difference (d1R2);

9 means (90) for selecting among the averages (y1V, y1L1, y1L2, y1R1,
10 y1R2) based on an absolute value of a minimal difference among the differences
11 (d1V, d1L1, d1L2, d1R1, d1R2); and,

12 means (44) for constraining the selecting step to the vertical average (y1V)
13 if the differences among the averages are ambiguous.

1 16. The deinterlacing circuit of claim 15, wherein the minimal difference is
2 ambiguous when:

3 a value for the given output pixel fails to be within a range of values defined
4 by an adjacent pixel above the given output pixel and an adjacent pixel below the
5 given output pixel; or,

6 the minimal difference among the respective differences fails to be unique.

1 17. The deinterlacing circuit of claim 15, wherein:

2 the vertical average is determined from pixels vertically adjacent to the
3 given output pixel;

4 the first left diagonal average is determined from upper left and lower right
5 diagonally adjacent pixels;

6 the first right diagonal average is determined from upper right and lower left
7 diagonally adjacent pixels;

8 the second left diagonal average is determined from two pixels to the left
9 and above the given output pixel and two pixels to the right and below the given
10 output pixel; and,

11 the second right diagonal average is determined from two pixels to the right
12 and above the given output pixel and two pixels to the left and below the given
13 output pixel.

1 18. The deinterlacing circuit of claim 15, wherein the selecting means (90)
2 comprises:
3 left diagonal selecting means (91) for selecting between the first left
4 diagonal average and the second left diagonal average to provide a selected left
5 diagonal average (y1L); and,
6 right diagonal selecting means (92) for selecting between the first right
7 diagonal average and the second right diagonal average to provide a selected right
8 diagonal average (y1R) based on the minimal difference.

1 19. The deinterlacing circuit of claim 18, wherein the selecting means (90)
2 comprises output selecting means (32) for selecting among the selected left
3 diagonal average (y1L), the selected right diagonal average (y1R), and the vertical
4 average (y1V) based on the minimal difference among the respective differences.

1 20. The deinterlacing circuit of claim 18, wherein:
2 the left diagonal selecting means (91) selects the first left diagonal average
3 when the left diagonal average and the second left diagonal average are equal;
4 and,
5 the right diagonal selecting means (92) selects the first right diagonal
6 average when the right diagonal average and the second right diagonal average
7 are equal.

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